Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Lower-extremity amputation among patients with diabetes: percentage of admissions for any-listed diagnosis of diabetes and any-listed procedure of lower-extremity amputation per 100,000 population, ages 18 years and older.

Source(s)

AHRQ QI research version 5.0. Prevention quality indicator 16 technical specifications: lower-extremity amputation among patients with diabetes rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: rate of lower-extremity amputation among patients with diabetes (PQI 16). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

Measure Domain

Primary Measure Domain

Related Population Health Measures: Population Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of admissions for any-listed diagnosis of diabetes and any-listed procedure of lower-extremity amputation per 100,000 population, ages 18 years and older.

Rationale

Patients with diabetes are at high risk of developing neuropathic problems of the lower limbs along with peripheral vascular disease. When these conditions are not diagnosed in the early stage, a window of opportunity is missed to ameliorate symptoms and prevent the development of the foot ulcers, infection,

or other causes of limb ischemia that can lead to non-traumatic lower-extremity amputation. Lower-extremity amputation not only leads to physical disability and loss of quality of life, but also to economic burden (i.e., healthcare costs and industrial disability).

The majority of lower-extremity amputations associated with diabetes can be prevented through better primary and specialty care. This starts with early identification of diabetes and long-term glycemic control followed by early identification and appropriate therapy of the patient who is at increased risk for ulceration and amputation. Lowering A1C to below or around 7% has been shown to reduce long-term vascular disease if implemented soon after the diagnosis of diabetes. Preventing lower-extremity amputation requires a partnership between providers and patients. Patients at risk require lifelong surveillance, examination of the feet at each healthcare visit, risk stratification, and referral for therapeutic footwear and orthoses when needed. Patients and or caregivers must be educated and equipped to fulfill their responsibilities of daily foot inspection, associated foot care practices, and general diabetic management. Early identification and management of the diabetic neuropathy provides an opportunity to alleviate symptoms and prevent the development of major clinical neuropathic endpoint of the lower limbs. When infection or a wound does occur, proper wound care, optimal metabolic control, and early aggressive, appropriate surgical and medical therapy can often preserve function and prevent the loss of limb.

This measure is an avoidable hospitalization/ambulatory care sensitive condition (ACSC) type indicator. ACSC type indicators are not measures of hospital quality, but rather measures of potentially avoidable hospitalization if appropriate outpatient care, other healthcare services or community services were accessed and obtained (i.e., measures of the health care system broadly defined). These measures are designed to assess population access to timely, high quality outpatient and public health services in a particular geographic area, for the purpose of managing chronic disease or diagnosing acute illnesses before progressing to inpatient treatment. These measures are of most interest to comprehensive health care delivery systems, such as some health maintenance organizations (HMOs), accountable care organizations (ACOs) or public health agencies. ACSC indicators correlate with each other and they may be used in conjunction as an overall examination of outpatient care and access to care at a national, regional or county level.

Evidence for Rationale

National Quality Forum measure information: rate of lower-extremity amputation among patients with diabetes (PQI 16). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

Primary Health Components

Diabetes; lower-extremity amputation; ambulatory care sensitive condition (ACSC)

Denominator Description

Population ages 18 years and older in metropolitan area or county (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Discharges, for patients ages 18 years and older, with any-listed International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) procedure codes for lower-extremity amputation and any-listed ICD-9-CM diagnosis codes for diabetes (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

In the United States, there are approximately 24 million people (7.8% of the population) currently living with diabetes, nearly 6 million of whom are unaware of their diagnosis (American Diabetes Association [ADA], 2010). The financial cost of diabetes is estimated at approximately $132 billion annually; $92 billion is attributed to direct medical care and the remaining $40 billion is due to disability, work loss, and premature mortality (Hogan, Dall, & Nikolov, 2003). With the continued increase in diabetic prevalence, it is estimated that annual diabetes-related costs will reach $336 billion by 2034 (Huang et al., 2009). Much of the costs associated with diabetes results from long-term complications, such as lower-extremity amputation (Correa-de-Araujo, McDermott, & Moy, 2006; Abou-Zamzam et al., 2007). Patients with diabetes are 20 times more likely to undergo a lower-extremity amputation than those without (van Houtum, Lavery, & Harkless, 1996). Diabetic patients who have lower-extremity amputation and other diabetes-related foot disorders have lower quality-of-life measures (health-related quality of life, physical functioning, social functioning, and mental health) compared to other patients with diabetes (Hjelm, Nyberg, & Apelqvist, 2002). Given the important economic, health, and personal costs, reducing the number of diabetes-related lower-extremity amputation has become a national healthcare priority (U.S. Department of Health and Human Services, 2000).

Despite the ADA (2013) long standing recommendations for neurological foot examinations, many practitioners are unable to correctly identify peripheral neuropathy in their patients (Driver et al., 2010). A large telephone survey of patients with diabetes also confirmed that patients did not recognize the term neuropathy and did not associated the term with the cause of their neuropathic symptoms (Sanders, 2005). Besides long-term glycemic control (which reduces the risk of lower-extremity amputation but does not appear to change the overall risk of macrovascular complications) (Hemmingsen et al., 2011), team approaches to manage diabetic foot ulcers, such as foot clinics, outpatient case management programs, limb salvage teams, increased access to care, and podiatrists have been shown to significantly reduces diabetic lower-extremity amputation rates (Driver et al., 2010; Rümenapf et al., 2013; Robbins, Valdmanis, & Webb, 2008; Gibson et al., 2014; Etnyre et al., 2011; Sloan et al., 2008). According the Centers for Disease Control and Prevention (CDC) Fact Sheet (2011), it is estimated that 45% to 85% of amputations can be prevented by comprehensive foot care programs (i.e., that include risk assessment, foot-care education and preventive therapy, treatment of foot problems, and referral to specialists).

Amputations are higher for black Americans and other racial groups compared to white (CDC, 2011; Gornick et al., 1996; Chin, Zhang, & Merrell, 1998). Many of the racial differences in amputation can be attributed to access to care and family poverty. Racial differences are diminished when access to care is equivocal (Karter et al., 2002; Reiber, Pecoraro, & Koepsell, 1992; Selby & Zhang, 1995).

Evidence for Additional Information Supporting Need for the Measure

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National Quality Forum measure information: rate of lower-extremity amputation among patients with diabetes (PQI 16). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

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Extent of Measure Testing

Reliability Testing

The developer's metric of reliability is the signal to noise ratio, which is the ratio of the between county (area) variance (signal) to the within county (area) variance (noise). The formula is signal / (signal + noise). There is a county (area)-specific signal to noise ratio, which is used as an empirical Bayes univariate shrinkage estimator. The overall signal to noise ratio is a weighted average of the county (area)-specific signal-to-noise ratio, where the weight is [1 / (signal + noise)^2]. The signal is calculated using an iterative method. The analysis reports the reliability of the risk-adjusted rate (before applying the empirical Bayes univirate shrinkage estimator).

Overall the risk-adjusted rate is moderately reliable. Based on a norm of a signal-to-noise ratio of 0.80, 30% of counties (areas) exceed the norm. Reliability is less than the norm in counties with population less than approximately 35,000 persons, meaning that the performance score is reliability adjusted closer to the shrinkage target in those counties.

Validity Testing

The developer conducted construct validity testing to examine the association between the risk-adjusted rate and county (area) structural characteristics potentially associated with quality of care, including prior performance, using regression analysis.

Given the stated rationale, the expectation for the regression analysis given the expected relationship between the "Less Access to High Quality Outpatient Care" construct validity measure (F1) and the county (area) risk-adjusted rate is a positive, statistically significant coefficient. The expectation for the regression analysis given the expected relationship between the "More Market Competition" construct validity measure (F2) and the county (area) risk-adjusted rate is a positive, statistically significant coefficient. The results are consistent with expectations. Also, past performance is a moderate predictor of current performance with a coefficient of 0.75.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

National Quality Forum measure information: rate of lower-extremity amputation among patients with diabetes (PQI 16). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Regional, County or City

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Framework for Public Health Quality

Public Health Aims for Quality

Population-centered

Risk Reducing

Vigilant

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

The time period is one year.

Note: The reference population rates and signal variance parameters assume a one-year time period.

Denominator Sampling Frame

Geographically defined

Denominator (Index) Event or Characteristic

Geographic Location

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Population ages 18 years and older in metropolitan area (MA) or county. Discharges in the numerator are assigned to the denominator based on the MA or county of the patient residence, not the MA or county of the hospital where the discharge occurred.

Note:

> The term MA was adopted by the United States (U.S.) Census in 1990 and referred collectively to metropolitan statistical areas (MSAs), consolidated metropolitan statistical areas (CMSAs), and primary metropolitan statistical areas (PMSAs). In addition, "area" could refer to either 1) Federal Information Processing Standard (FIPS) county, 2) modified FIPS county, 3) 1999 Office of Management and Budget (OMB) Metropolitan Statistical Area, or 4) 2003 OMB Metropolitan Statistical Area. Micropolitan Statistical Areas are not used in the Quality Indicator (QI) software.
> The denominator can be specified with the diabetic population only and calculated with the SAS QI software through the condition-specific denominator at the state-level feature.

Exclusions
Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Discharges, for patients ages 18 years and older, with any-listed International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) procedure codes for lower-extremity amputation and any-listed ICD-9-CM diagnosis codes for diabetes

Note: Refer to the original measure documentation for ICD-9-CM codes. See also the *Prevention Quality Indicators Appendices*.

Exclusions
Exclude cases:

- With any-listed ICD-9-CM diagnosis codes for traumatic amputation of the lower extremity
- With any-listed ICD-9-CM procedure codes for toe amputation
- Transfer from a hospital (different facility)
- Transfer from a Skilled Nursing Facility (SNF) or Intermediate Care Facility (ICF)
- Transfer from another health care facility
- Major Diagnostic Categories (MDC) 14 (pregnancy, childbirth, and puerperium)
- With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), principal diagnosis (DX1=missing), or county (PSTCO=missing)

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Does not apply to this measure (i.e., there is no pre-defined preference for the measure score)

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with area random effect) and covariates for gender and age (in 5-year age groups). The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the year 2010 (combined), a database consisting of 46 states and approximately 38 million adult discharges, and the United States (U.S.) Census data by county. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., area). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Refer to the original measure documentation for the specific covariates for this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

PQI 16: lower-extremity amputation among patients with diabetes rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Prevention Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2014 Sep 18

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

AHRQ QI. Prevention quality indicators #16: technical specifications. Rate of lower-extremity amputation among patients with diabetes [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 2 p.
AHRQ quality indicators. Prevention quality indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 6 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site .

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Prevention quality indicators (PQI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 21 p. This document is available from the AHRQ Quality Indicators Web site .
AHRQ quality indicators. Prevention quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 9 p. This document is available from the AHRQ Quality Indicators Web site .
AHRQ quality indicators. Prevention quality indicators (PQI) composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Apr 7. various p. This document is available from the AHRQ Quality Indicators Web site .
HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site .

NQMC Status

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Copyright Statement

Production

Source(s)

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